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The impact of screening strategies on the performance of ESG indices

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Abstract

This paper analyzes the effect of screening strategies on the performance of ESG indices. We use 17 ESG indices that are actively managed, representing different index providers and ESG rating agencies, different ESG screening strategies, two types of weights for the construction of the ESG indices, and covering different investment regions (World, Europe and the US). The performance comparison between ESG and non-ESG indices and within ESG indices is examined from different risk-adjusted performance measures based on standard and tail risk measures. We show that the ESG screens for equities neither lead to a significant out-performance nor an under-performance compared to the benchmarks. For the ESG indices we find that no index provider displays the highest (or lowest) performances in each region of interest. We also find that the selection criteria lead to higher concentration in some sectors or countries, implying effects on the risk-adjusted performance of between ESG and non-ESG indices and also within ESG indices. Finally, the results on the ESG indices suggest that the weights used to construct these indices (sustainability-score weights vs market cap-weights) seem to have an impact on their risk and their performance.

Keywords: ESG indices; Socially responsible investing; performance measurement.
JEL Classification: G15; M14; Q56.

1 Introduction

There is a considerable growth of sustainable and socially responsible investment (SRI) in the world, rising from $13.3 trillion at the outset of 2012 to $21.4 trillion at the start of 2014 (Global Sustainable Investment Alliance, 2014). For example, the number of European SRI funds rose from 159 in December 1999 to 1204 in 2015, with assets under professional management increasing from Euro 11.07 billion to Euro 136 billion (Vigeo, 2015). In the US, the number of SRI funds increased from 168 in December 1999 to 925 in 2014, while assets under management rose from $154 billion to $4,306 billion (SIF, 2014). This large-scale growth of SRI around the world has motivated an intense debate on the implications of incorporating social, environmental and ethical criteria in the portfolio selection process. SRI is the investment that finances companies meet environmental, social and corporate governance (ESG) issues. Environmental issues encompass pollution and contamination of land, air and water, related legal and regulatory compliance, eco-efficiency, waste management, natural resource scarcity and climate change. Social issues encompass the treatment of employees, health and safety, labor conditions, human rights, supply chains, and treating customers and communities fairly. Corporate governance in a responsible investment sense is generally held to encompass the governance of environmental and social issue management, plus the areas of anti bribery and corruption, business ethics and transparency. This development is fueling private and institutional investment decisions towards SRI, also labeled ethical or sustainable investing (Renneboog, Terhorst and Zhang, 2008). This investment strategy consists of choosing stocks on the basis of ESG and ethical screens (Barnett and Salomon, 2006).

The growth in the volume SRI assets has attracted academic interest so that several empirical studies examine the relationship between environmental, social, corporate governance or ethical investments and stock performance. Most studies in this field consider the investor perspective, i.e. by comparing the stock performance of SRI funds or portfolios with the stock performance of conventional funds or portfolios. Some studies have compared the performance of SRI funds with the corresponding conventional mutual funds (e.g., Bauer et al., 2005, 2007; Capelle-Blancard and Monjon, 2014; Leite and Cortez, 2014; Mollet and Ziegler, 2014). However, this approach ignores the fact that differences in financial performance may be due to differences in the ability of fund managers rather than the nature of the investments. Others studies provide a solution to this issue by comparing the performance of SRI indices with conventional indices based on the argument that indices are immune to biases associated with specific funds, such as management quality or operating costs and hence serve to isolate the impact of the SRI factor on performance (e.g., Sauer, 1997; Statman, 2000, 2006; schröder, 2007; Belghitar et al., 2014). Therefore, our study concentrates on ESG equity indices which are a much easier and more

direct way to measure the performance contribution of ESG screening.

All the major index providers (FTSE, MSCI, STOXX, S&P Dow Jones) build and provide ESG indices. ESG indices integrate non-financial criteria into the investment process by applying a set of investment screens, designed to select (positive screens) or to exclude (negative screens) assets from their indices. Negative screens exclude stocks of companies that perform poorly in terms of ESG indicators or that are involved in socially undesirable activities (e.g., tobacco, gambling, alcohol, armaments) whereas positive screens identify companies that have good records of ESG in specific stakeholder-oriented issues, such as labor and community relations, and environment. The index providers apply different ESG screening strategies for inclusion of equities in ESG indices based on indicators provided by ESG rating agencies (e.g., EIRIS, RobecoSAM, Sustainalytics, Vigeo). The Global Sustainable Investment Alliance suggests a classification for the different ESG screening strategies, such as exclusionary screening, best-in-class screening or integration of ESG factors (see Appendix A). Few studies investigate the performance of SRI funds according to the type of screening strategy used (Goldreyer et al., 1999; Nofsinger and Varma, 2012; Leite and Cortez, 2014). Their results suggest that different types of screens do impact fund performance differently. To the best of our knowledge, there is no study that examines the performance of ESG indices according to the type of screening strategy. Most of ESG indices are constructed using market capitalization weights, and only few are based on sustainability-score weights (STOXX ESG Leaders 50, STOXX Sustainability 40 and DJSI Europe 40). It is interesting for the investors and index providers to examine whether the system of weights for constructing indices has an effect on the performance of the ESG indices.

Due to its simplicity and its easy interpretability the Sharpe ratio (Sharpe, 1966) has become one of the most widely used risk-adjusted performance measures (Weisman, 2002), and thus is often applied in the performance comparison of ESG and non-ESG indices.[1] However, there are some shortcomings of the Sharpe ratio, especially it assumes that asset returns are normally distributed (and thus symmetrical) as it measures risk by standard deviation, and standard deviation does not treat variability in gains and variability in losses separately (i.e. the Sharpe ratio penalizes for both downside and upside variability in returns). Therefore, there is a growing body of literature which proposes alternative performance measures.[2] Some studies considered the asymmetry of return distributions in their performance measures with downside risk-adjusted measures of performance. Sortino and Price (1994) advocated the

[1] We assume here that the indices are not actively managed in the profitability sense so we can not define a minimum return or a specific risk, thus we consider risk-adjusted performance measures taking into account only total risk.

[2] For a review of the literature on performance measures see, for example, Le Sourd (2007), Bacon (2008), Cogneau and Hübner (2009a, 2009b) and Caporin et al. (2014).

use of downside deviation as a risk measure rather than traditional (Gaussian-based) risk measures such as standard deviation. Other studies suggested to use tail risks in performance measures, which allow for fat tails of the distribution due to large and abrupt movements in equity returns, such as Reward to Value-at-Risk (VaR) ratio (Dowd, 2002) and conditional Sharpe ratio (Argawal and Naik, 2004), based on VaR and conditional VaR measures of risk. Performance measurement has been limited to the first two moments of equity return distributions, namely investors have only mean-variance preferences. One important reason to believe that third moments and higher are important determinants of performance is that these higher moments of return distributions (skewness and kurtosis) do matter to investors, who show a preference for positive skewness and an aversion to kurtosis (see, e.g., Kraus and Litzenberger, 1976; Fang and Lai, 1997; Dittmar, 2002; Post et al., 2008). Performance measures based on higher moments have been proposed, such as the adjusted Sharpe ratio (Pezier and White, 2008) and the modified Sharpe ratio (Gregoriou and Gueyie, 2002). Therefore, we use risk-adjusted performance measures based on standard risk measures (standard deviation and semivariance) and tail risk measures (VaR and conditional VaR) as well as measures based on three and four moments.

Compared to the previous studies on SRI equity indices, our study extends the research in three ways. Firstly, we analyze 17 ESG indices that are actively managed, representing different index providers and ESG rating agencies, different ESG screening strategies (exclusionary screening, best-in-class screening and integration of ESG factors), and covering different investment regions (World, Europe and the US). Secondly, we compare two types of weights for the construction of the ESG indices, namely weights based on sustainability scores or float-adjusted market capitalization weights. Finally, the performance comparison between ESG and non-ESG indices and within ESG indices is examined from risk-adjusted performance measures based on standard risk measures (standard deviation and semivariance) and tail risk measures (Value-at-Risk and expected shortfall) as well as measures based on three and for moments.

The findings of this paper are of interest to practitioners, fund managers and the general investing public. We show that the ESG screens for equities neither lead to a significant out-performance nor an under-performance compared to the benchmarks. Therefore, the relative performance of ESG equity investments should be at least as good as conventional investments. For the ESG indices we find that no index provider displays the highest (or lowest) performances in each region of interest. We also find that the selection criteria lead to higher concentration in some sectors or countries, implying effects on the risk-adjusted performance of between ESG and non-ESG indices and also within ESG indices. Finally, the results on the ESG indices suggest that the weights used to construct these indices (sustainability-

score weights vs market cap-weights) seem to have an impact on their risk and their performance.

The remainder of this paper is organized as follows: Section 2 presents the background, and Section 3 describes the risk-adjusted performance measures. The data are presented in Section 4, and the empirical results are discussed in Section 5. The conclusion is drawn in Section 6.

2 Background

The issue of over or under performance of SRI has been widely studied in the literature, with mixed results on the profitability of SRI. Two schools of thought have emerged.

The first trend stems from the foundations of the modern theory of Markowitz portfolio (1952) and believes that SRIs would be less profitable and more risky than their traditional counterparts. This theory assumes that investors want to maximize their profits and minimize their risks, and this is possible only through optimal diversification of the portfolio securities. However, by restricting them voluntarily universe investment, SRIs diminish their opportunities to diversification, which would result in a portfolio equivalent profitability with a greater risk or a lower cost for equivalent risk. Proponents of this first major trend are supported by a number of researchers who claim, in addition, SRI funds would suffer additional costs filtering and control inherent in the creation of a special investment universe, which directly alter the performance of these investments (Bauer et al., 2005; Barnett and Salomon, 2006). This latter argument seems questionable in that each fund requires a cost management and cost comparisons management is difficult to implement. Finally, if SRI is really more profitable, in efficient markets, prices rise but the expected returns for holding responsible companies is not different from those of non-responsible firms, they are only trade at high prices (Pouget, 2014).

The second major trend argues, instead, that SRIs would outperform their traditional counterparts because of their desire to promote competitive companies in corporate social responsibility (CSR). CSR is, indeed, a future performance factor firms. Manage risks upstream as build relationships qualities with stakeholders, regardless of the environment, human rights and labor would make the company better equipped to face the future (Barnett and Salomon, 2006). In addition, good practices in ESG allow the company to enjoy better picture reputational, which would be reflected in its stock price and positively influence the cost of access of these companies to capital (El Ghoul et al., 2011).

Some authors have compared the performance of SRI indices.[3] See Table 1 for a summary. Sauer

[3] See UNEP Financial Initiative and Mercer (2007) and Sjöström (2011) for a review of literature on financial performance of SRI funds and indices.

(1997) and Statman (2000) compared the performance of the Domini Social Index with the S&P 500 index. They used the Sharpe ratio and the Jensen's alpha estimated from the CAPM for the comparison, and found no significant difference in the performance of both indices. Statman (2006) extended his previous study in terms of time horizon and Fama-French 3-factor model, and compared the performance of four SRI indices (Domini Social Index, Calvert's Social Index, Citizen's Index and Dow Jones Sustainability US Index) with the S&P 500 index. He found evidence that the returns of the SRI indices exceeded the returns of the S&P 500, but the results were not statistically significant. These studies were limited to the US. Schröder (2007) analyzed the performance of 29 SRI indices worldwide published by 11 different suppliers. Using the Sharpe ratio and the CAPM to estimate alpha as the performance parameter, he found no significant difference in the performance between SRI and non-SRI indices. But many SRI indices have a higher risk relative to the benchmarks. Collison et al. (2008) and Belghitar et al. (2014) examined FTSE4Good indices which cover four geographical regions (US, UK, Europe and Global), in benchmark or tradable format for Collison et al. (2008). Applying standard performance measures, namely Sharpe ratio, Treynor ratio and Jensen's alpha estimated from both CAPM - and Carhart 4-factor model for Belghitar et al. (2014), they showed that there is nothing to be gained or lost from socially responsible investing in terms of mean and variance. However, when using the concept of Marginal Conditional Stochastic Dominance to estimate investment performance which accommodate to any return distribution, in particular third and fourth moments, Belghitar et al. (2014) found that indices composed of socially responsible firms are dominated by indices composed of conventional firms in trademarked indices, indicating that there is a price to be paid in the higher moments of the return distributions. Finally, Consolandi et al. (2009) analyzed the performance of the Dow Jones Sustainability Stoxx Index (DJSSI) compared to that of the Surrogate Complementary Index (SCI) that includes only the components of the DJ Stoxx 600 that do not belong to the ethical index to evaluate more correctly the size of possible divergent performances. They showed that the difference of performance between the DJSSI and the DJ Stoxx 600 is very limited. The difference of performance with the surrogate benchmark SCI is bigger but still quite limited. They argued, however, that the results change as soon as they take account of the bigger dimension of the firms selected in the ethical index DJSSI as compared to that of the index SCI, and found that the performance of the equally weighted ethical index DJSSI slightly outperforms the benchmarks.

3 Performance measures

The standard performance measures developed in the literature consist of investigating the relationship between the expected returns and risk associated with investment in risky financial assets. Several tools have been introduced to evaluate stock market index performance and these often differ depending on the type of risk measure under consideration. We apply different Sharpe-ratio type measures based on various proxies of (total) risk: standard deviation, semivariance, Value-at-Risk, Conditional VaR and Modified VaR.

3.1 Ratios based on standard total risk

Sharpe Ratio. The first performance measure is the Sharpe ratio (*SR*), also often referred to as "Reward to Variability", which indicates if an investment's high return is a result of excessive risk. It measures the performance of an index by dividing the amount of excess return (risk premium) to total risk, measured by standard deviation. The higher the *SR* is consistent with a higher probability that the index return exceed the risk-free return. If the *SR* is negative (resp. positive), the index i underperforms (resp. outperforms) the referential given by the risk-free asset.

$$SR_i = \frac{(R_{i,t} - R_{f,t})}{\sigma(R_{i,t})}$$

where $R_{i,t}$ denotes the stock return of the index i, $R_{f,t}$ refers to the risk-free return, and $\sigma(R_{i,t})$ the standard deviation of the returns of the index i.

Adjusted Sharpe Ratio. To overcome the drawbacks of the SR, especially those caused by the assumption of normally distributed returns Pezier and White (2008) suggested an Adjusted Sharpe ratio (ASR) to overcome this deficiency which accounts for the higher moments of distributions. The measure is derived from a Taylor series expansion of expected utility with an exponential utility function.

$$ASR_i = SR_i \left[1 + (\frac{Skew}{6}) SR_i - (\frac{Kur}{24}) SR_i^2 \right]$$

where *Skew* and *Kur* denote the skewness and the excess kurtosis, respectively. The ASR accounts for the fact that investors prefer positive skewness and negative excess kurtosis, as it contains a penalty factor for negative skewness and positive excess kurtosis. If the returns are normally distributed the ASR yields the traditional SR.

Sortino ratio. Another approach to overcome the deficiencies of SR performance measures if returns deviate from the normal distribution, are performance measures based on lower partial moment (LPM)

ratio as risk measure. Here, we only focus on the Sortino ratio (*SOR*) which is a modification of the *SR* but penalizes only the returns falling below a user-specified target or required rate of return, while the *SR* penalizes both upside and downside volatility equally.

$$SOR_i = \frac{(R_{i,t} - R_{f,t})}{SV(R_{i,t})}$$

where $SV(R_{i,t})$ is the semivariance (downside risk) of the returns of the index *i*, which can be interpreted as the square root of the LMP(2) (Kaplan and Knowles, 2004).[4]

3.2 Ratios based on Value-at-Risk

Reward-to-VaR ratio. Dowd (2002) proposed the Reward-to-VaR ratio (*RVaR*) which it is similar to the *SR* but it uses the tail risk measure Value-at-risk (VaR) as proxy for risk:

$$RtoVaR_i = \frac{(R_{i,t} - R_{f,t})}{\overline{VaR}_i}$$

where VaR_i represents the VaR measure of the index *i*. VaR quantifies the potential loss for a portfolio of assets (R_t) under normal market condition over a given period of time horizon *h* with a certain confidence level $(1-\alpha)$, at time *t* conditionally on available information $\Omega_{t-1} : P\{(R_t \geq VaR_{t,h}(\alpha)|\Omega_{t-1}\}$. To take into account time-varying volatility in stock returns we estimate in-sample VaR under 95% confidence levels based on a GJR-GARCH model proposed by Glosten, Jagannathan, and Runkle (1993) that accounts for most important stylized facts of stock returns, which are heavy-tailed distribution, volatility clustering and the so-called leverage effect.[5] The parameters of the volatility models are estimated by maximizing the log-likelihood function from the Berndt et al. (1974) (BHHH) algorithm.[6]

Conditional Sharpe ratio. In order to overcome the shortcoming of VaR, which is not considered as

[4]The semivariance is defined as $SV = T^{-1} \sum_{R_i < MRT} (R_i - MRT)^2$, where *MRT* is the minimum return threshold (MRT). The SV can be considered as a special case of the lower partial moments (LPM). LPMs measure risk by considering only those deviations that fall below an ex-ante defined threshold. The LPM of order *k* around the threshold return R_T is simply equal to the expectation of the positive difference between the critical value and the yield to the power *k*, given by: $LMP(k,R_T) = \int_{-\infty}^{R_T} (R_T - R)^k dF(R) = E(max(R_T - R, 0))^k$. For the case where the target return is equal to the mean of the distribution, the LPM of order $k = 2$ corresponds to the semivariance.

[5]Stock returns exhibit some degree of asymmetry in their conditional variances, i.e. that market participants overreact to bad news as compared to good news (Black, 1976; French, Schwert and Stambaugh, 1987; Bollerslev, Chow, and Kroner, 1992). We do not search the best volatility models for computing VaR, but this point will be examined in future research.

[6]To estimate these returns series, we use G@RCH 7.0 for Ox, a package dedicated to the estimation of GARCH-type models.

a coherent risk measure in the sense of Artzner et al. (1999).[7], the conditional VaR (*CVaR*), coherent measure of risk introduced by Rockafellar and Uryasev (2002) and defined as the expected value of the losses conditional on the loss being larger than the VaR, can be used for assessing risk-adjusted performance, giving the Condition Sharpe ratio (CSR) (Argawal and Naik, 2004):

$$CSR_i = \frac{(R_{i,t} - R_{f,t})}{CVaR_i}$$

where $CVaR_i$ represents the CVaR measure of the index i, with $CVaR(\alpha) = E(|L_t| > |VaR_{t,h}(\alpha)|)$, where L_t is the expected value of loss if a VaR_t violation occurs.

Modified Sharpe ratio. The *RVaR* and *CSR* are based on empirically deviations from the normal distribution. Therefore, Gregoriou and Gueyie (2002) propose an alternative performance measure with the Modified Sharpe ratio (MSR) based on the modified VaR (MVAR) which adjusts VaR for skewness and kurtosis.

$$MSR_i = \frac{(R_{i,t} - R_{f,t})}{\overline{MVaR}_i}$$

The MVaR is suggested by Favre and Galeano (2002) by using a Cornish-Fisher approximation to modify the quantile of the standard normal distribution: $MVaR(\alpha) = \mu(R_{i,t}) - Z_{CF}\sigma(R_{i,t})$, where the modified quantile Z_{CF} is given by $Z_{CF} = Z_\alpha - \frac{1}{6}(Z_\alpha^2 - 1)Skew + \frac{1}{24}(Z_\alpha^3 - 3Z_\alpha)Kur - \frac{1}{36}(2Z_\alpha^3 - 5Z_\alpha)Skew^2$, with Z_α the quantile of the standard normal distribution and $\mu(R_{i,t})$ the mean of the returns of the index i. The MVaR allows thus to compute the VaR for distributions with asymmetry (positive or negative skewness) and fat tails (positive excess kurtosis). The MSR yields the same results than the RVaR if returns are normally distributed.

4 Data

For the purpose of our analysis, we consider the daily data of broad ESG and non-ESG indices, spanning September 1^{st}, 2010 to January 5^{th}, 2015 (1,130 observations). We take into account ESG indices covering three geographical regions, Global (World), Europe and the US, and published by six different index providers, MSCI, ECPI, ESI, STOXX, DJSI and FTSE4Good indices. Each of these index providers follow different ESG screening strategies based on indicators provided by ESG rating

[7] In the properties a coherent measure functional must satisfy on an appropriate probabilistic space, the sub-additivity property does not hold for all cases. Specific portfolios can be constructed where the risk of a portfolio with two assets can be greater than the sum of the individual risks therefore, violating sub-additivity and in general the diversification principle (Scaillet, 2000).

agencies (e.g., EIRIS, RobecoSAM, Sustainalytics, Vigeo). We compare the ESG indices with their non-ESG counterparts. The daily returns are computed as the natural logarithmic first difference of the daily closing prices, which are obtained from Datastream Thomson and Stoxx. The logarithmic stock returns are multiplied by 100 to avoid convergence problems.

Table 2 summarizes the information on ESG indices concerning the index provider, ESG rating agency[8], the region, the ESG selection approach with additional financial and sector criteria, the type of weights used for the construction of the indices, the number of constituents, and their benchmarks. For the ESG strategies we follow the classification suggested by the Global Sustainable Investment Alliance.[9] MSCI, DJSI, ECPI and ESI apply the Best-in-class strategy, with additional exclusion and financial criteria for ECPI and ESI, while FTSE4Good and STOXX use Integration of ESG factors and Exclusionary screening strategies, respectively. Most of the ESG indices are constructed using float-adjusted market capitalization weights. DJSI Europe 40 and STOXX Europe Sustainability 40 indices are weighted from sustainability scores calculated by RobecoSAM and Bank Sarasin, respectively, whereas STOXX ESG Leaders (Global and Europe) the weighting is based on the company's average ESG rating from Sustainalytics. These three ESG indices are blue-chip indices. All ESG indices concentrate on stocks with a large market capitalization, and thus avoid the small-cap bias, i.e. the relatively high investment weight of stocks with a low market capitalization, which has been found in several studies (see, e.g., Schröder, 2004; Bauer et al., 2005).

Table 3 gives the proportion of firms in each sector-index among the sector classifications based on the Global Industry Classification Standard (GICS) or the Industry Classification Benchmark (ICB) and among the Europe and US countries for the World indices, and the number of stocks used in the calculation of each index. The number of constituents included in the conventional indexes varies from 360 (the S&P Europe index) to 7,303 firms (the DJ Global index). The application of the filtering criteria reduces the number of stocks included in the ESG indices by 40-50% (compared with the broad universe of investable stocks included in the conventional indexes). Most of ESG and non-ESG indices are Financial sector oriented, except the US indices that are rather Technology oriented. Note that the ESG indices are more concentrated on Health care sector than the non-ESG indices. For the World/Global

[8] See Novethic (2013) for an overview of ESG rating agencies.

[9] The Global Sustainable Investment Alliance suggests seven distinct approaches: Negative/exclusionary screening; Positive/best-in-class screening; Norms-based screening; Integration of ESG factors; Sustainability themed investing; Impact/community investing; and Corporate engagement and shareholder action. See Appendix A for a description of these strategies.

indices, all non-ESG indices are US-country oriented whereas the DJSI and ESG STOXX indices are rather Europe-country oriented.

Table 4 gives basic descriptive statistics for the returns of ESG and non-ESG indices. The ESG and non-ESG US indices display higher mean returns. All the returns are highly non-normal, i.e. showing evidence of negative excess skewness and excess kurtosis. All series are leptokurtic (i.e., fat-tailed distribution) and thus the variance of the index prices is principally due to infrequent but extreme deviations. These characteristics are important for risk averse investors who show a preference for positive skewness and an aversion to leptokurticity (see, e.g., Kraus and Litzenberger, 1976; Fang and Lai, 1997; Dittmar, 2002; Post et al., 2008). The Ljung-Box test (Q(10)) provides evidence of serial correlation in all stock returns, except for European indices in most cases. Finally, the Lagrange Multiplier test for the presence of the ARCH effect (LM(10)) indicates clearly that the prices show strong conditional heteroscedasticity, which is a common feature of financial data. In other words, there are quiet periods with small price changes and turbulent periods with large oscillations.

5 Empirical results

The aim of this section is to investigate the differences of risk and performance between ESG and non-ESG indices, considering various (total) risk-adjusted performance measures based on standard and tail risk measures. We first compare each ESG index to its non-ESG counterpart, and then the comparison is within the ESG indices by regions.

5.1 Risk measures

Table 5 displays the standard and tail risk measures for ESG and non-ESG indices. The results show that the risk measures are higher for the non-ESG indices than for the ESG indices for the US and European markets, except for STOXX Europe 50 and STOXX Sustainability 40, suggesting that the ESG indices are less risky for these markets, whereas the results are mixed for the World (Global) market (Table 5). This result is in contrast with that of Schröder (2007) who finds that most of SRI indices can be characterized by high relative risk.[10] Tables 6 and 7 compare the risk measures between ESG indices in World, US and European markets. For the US, the FTSE4Good index based on ESG integration is more risky than the two others indices. The ESI Global index exhibits the lower level of risk for the World (Global) indices, whereas it is the STOXX Sustainability Europe index for the European indices. The

[10] Schröder (2007) studies the relative risk of SRI indices by using a CAPM, i.e. the systematic risk (beta), but not the total risk.

MSCI World and Europe indexes give interesting low level of risk. Note that, in contrast to Belghitar et al. (2014), we do not find differences in terms of risk between measures based on the first two moments and those based on higher moments, except for few VaR-risk measures.

5.2 Performance measures

The risk-adjusted performance measures for ESG and non-ESG indices are given in Table 8. Overall, the results are mixed for Global (World) and European indices. These results are consistent with most of the earlier studies (Sauer, 1997; Statman, 2000, 2006; Schröder, 2007): the ESG screens for equities neither lead to a significant out-performance nor an under-performance compared to the benchmarks. The latter is interesting as the ESG screening process reduces the investment universe which should, according to optimal portfolio theory, lead to a reduction in the risk-adjusted return. As this is not the case, an investment in ESG equity indices does not impose additional costs in terms of lower returns to the investor (Schröder, 2007). Further, we find some interesting results. First, the non-ESG stock indices outperform their ESG counterparts for the US indices, whatever the measures. This can be explained by the fact that the US ESG indices are more Technology or Health care oriented than their counterparts. Second, the DJSI World and STOXX ESG Global indices that are Europe oriented underperform their non-ESG counterparts that are US oriented (see Table 3), suggesting a potential region effect in some World ESG indices.

Tables 9 and 10 compare the risk-adjusted performances between ESG indices in World, US and European markets. Overall, we do not find that one index provider displays the highest (or lowest) performances in each region of interest, whatever the measure of performance.

For the World (Global) indices the ECPI Global Ethical, MSCI World ESG and Global FTSE4Good indices give the higher performance than the World DJSI, Global STOXX and ESI Excellence Global indices. This can be explained by the fact that these three indices are US oriented whereas the others are Europe oriented (Table 3). When comparing the ESG indices between Europe and the US, the US indices display the highest performance. Further, the ECPI Global Ethical, MSCI World ESG and Global FTSE4Good indices are more Technology oriented than the others whereas the World DJSI, Global STOXX and ESI Excellence Global indices are more Industrial oriented than the other World ESG indices.

For the US, the FTSE4Good index based on ESG integration displays the highest level of risk-adjusted performance. Note that the selection from the ESG integration criterion implies that the US

FTSE4Good index is highly Technology oriented (28.37%, Table 3). The lowest performance for the US indices is given by the US DJSI index which is rather Health Care oriented whereas the two others are Technology oriented.

For Europe, we find that the ESI Excellence Europe, which is highly Consumer Services oriented, displays the highest performance. We also note that the ESG indices weighted by sustainability scores (DJSI Europe 40, STOXX Europe 50 and STOXX Sustainability 40) exhibit the lowest levels of risk-adjusted performance than those weighted by market capitalization (DJSI Europe and STOXX Europe Sustainability). This can be explained by the fact that the formers are more Consumer Goods oriented (around 20%) whereas the lasters are more Health Care oriented (around 15%).

Note that the ESG indices weighted by sustainability scores are blue-chip indices and less diversified than the others ESG indices. Note that on the whole the performance of investment is not sensitive to the performance measure used.

Overall, the results suggest that the selection criteria lead to higher concentration in some sectors or countries, implying effects on the risk-adjusted performance of between ESG and non-ESG indices and also within ESG indices.

6 Conclusion

This paper analyzed the effect of screening strategies on the performance of ESG indices. We used 17 ESG indices that are actively managed, representing different indices' suppliers and ESG rating agencies, different ESG screening strategies (exclusionary screening, best-in-class screening and integration of ESG factors), two types of weights for the construction of the ESG indices (sustainability-score weights or market cap-weights), and covering different investment regions (World, Europe and the US). The performance comparison between ESG and non-ESG indices and within ESG indices was examined from risk-adjusted performance measures based on standard and tail risk measures as well as measures based on three and for moments.

The findings of this paper are of interest to practitioners, fund managers and the general investing public. We showed that the ESG screens for equities neither lead to a significant out-performance nor an under-performance compared to the benchmarks. Therefore, the relative performance of ESG equity investments should be at least as good as conventional investments. For the ESG indices we do not found that one index provider displays the highest (or lowest) performances in each region of interest. We also found that the selection criteria lead to higher concentration in some sectors or countries, implying effects on the risk-adjusted performance of between ESG and non-ESG indices and also within ESG

indices. Finally, the results on the ESG indices suggested that the weights used to construct these indices (sustainability-score weights vs market cap-weights) seem to have an impact on their risk and their performance.

Further research should compare ESG indices constructed with sustainability-score weights and market cap-weights for the same sample of firms.

7 Compliance with Ethical Standards

This study was not founded. This article does not contain any studies with human participants or animals performed by any of the authors.

Table 1: Selected studies on performance of SRI indices.

Studies	Data	Sample	Risk-adjusted performance measures
Luck and Pilotte (1996)	Domini Social index	May 1990 - Sept. 1992 (M)	BARRA performance
Sauer (1997)	Domini Social index	January 1986 - December 1994 (M)	Sharpe ratio and Jensen's alpha from CAPM
Di Bartolomeo and Kurtz (1999)	Domini Social index	May 1990 - January 1999 (M)	performance from multi-factor model (CAPM and APT)
Statman (2000)	Domini Social index	May 1990 - Sept. 1998 (M)	Sharpe ratio, Modigliani ratio and Jensen's alpha
Statman (2006)	4 SRI indices	May 1990 - April 2004 (M)	Sharpe ratio, Modigliani ratio and Jensen's alpha from Fama-French 3-factor model, Tracking error
Schröder (2007)	29 SRI indices worldwide	Start date SRI - December 2003 (M)	Sharpe ratio and Jensen's alpha from CAPM
Collison et al. (2008)	8 FTSE4Good indices	January 1996 - December 2005 (D)	Sharpe ratio, Treynor ratio and Jensen's alpha from CAPM
Consolandi et al. (2009)	Dow Jones Sustainability Stoxx Index	January 1999 - December 2006 (D)	Sharpe ratio
Belghitar et al. (2014)	4 FTSE4Good indices	July 2001 - November 2010 (W)	Sharpe ratio, Treynor ratio, Jensen's alpha from CAPM and Carhart 4-factor model, and MCSD

Notes: Statman (2006) analyzes 4 SRI indices: Domini Social Index, Calvert's Social Index, Citizen's Index and Dow Jones Sustainability US Index. Schröder (2007) studies 29 SRI indices worldwide published by 11 different suppliers. Collison et al. (2008) and Belghitar et al. (2014) examine FTSE4Good indices which cover four geographical regions: US, UK, Europe and Global. MCSD: Marginal Conditional Stochastic Dominance

Table 2: Information on ESG indices

Indices	Indices supplier	ESG rating agency	Region	Selection criteria	Financial criteria	Sector criteria	Index construction (weights)	*N*	Benchmarks	*N*
MSCI ESG World	MSCI Group	MSCI	World	Best-in-class	50% of the	sector weights	float-adjusted	829	MSCI World	1643
MSCI ESG US			US	approach	market cap.		market cap.	355	MSCI US	637
MSCI ESG Europe			Europe		in each sector			229	MSCI Europe	442
FTSE4Good Global	FTSE Group	EIRIS	World	Integration of		exclusion of	float-adjusted	803	FTSE All World Dev.	2090
FTSE4Good US			US	ESG factors		controversial	market cap.	181	FTSE US	649
FTSE4Good Europe			Europe			sectors		326	FTSE Dev. Europe	515
DJSI World	S&P Dow Jones	RobecoSAM	World	Best-in-class approach		top 10% of ESG scores from each sector	float-adjusted market cap.	319	DJ Global	7303
DJSI US			US			top 20% of ESG scores from each sector		125	DJ US	1282
DJSI Europe			Europe			top 20% of ESG scores from each sector		154	DJ Europe	893
DJSI Europe 40			Europe		40 largest firms		sustainability score	40	STOXX Europe 50	50
STOXX ESG Global	STOXX Ltd	Sustainalytics	World	Exclusionary		exclusion of	price with	342	STOXX Global 1800	1800
STOXX ESG 50 Europe			Europe	screening	50 largest firms	controversial sectors	ESG weighting factor	50	STOXX Europe 50	50
STOXX Europe Sust.		Bank Sarasin	Europe			sector-specific criteria	float-adjusted market cap.	464	STOXX Europe 600	600
STOXX Europe Sust. 40			Europe		40 largest firms	sector-specific criteria	sustainability score	40	STOXX Europe 50	50
ECPI Global Ethical	ECPI Group	ECPI	World	Best-in-class approach	free float $\geq$ 50%	exclusion of controversial sectors	float-adjusted market cap.	300	S&P Global 1200	1215
ESI Excellence Global	NYSE Euronext	Vigeo	World	Best-in-class approach	free float $>$ EUR 10 billions		float-adjusted market cap.	500	S&P Global 1200	1215
ESI Excellence Europe			Europe	with exclusion	free float $>$ 0.05% of index market cap.			200	S&P Europe 350	360

Note: *N* denotes the number of firms. ESI: Ethibel Sustainability Index. EIRIS: Ethical Investment Research Service.

Table 3: Sector and country weights of ESG and non-ESG indices.

	Sectors										Country		
	Financials	Techno.	Health Care	Consumer Goods / Staples	Consumer Serv. / Discret.	Telecom.	Indus.	Energy	Materials	Utilities	Europe	US	*N*
MSCI World	20.9	13.8	13.3	10.4	13.3	3.4	10.6	6.5	4.5	3.3	15.3	58.4	1643
MSCI ESG World	21.7	13.4	14.7	9.1	13.2	3.6	10.7	5.1	5.3	3.2	11.8	56.8	829
MSCI Europe	22.9	3.6	14.1	14.7	11.5	5.0	11.0	6.5	6.6	4.0	100	0	442
MSCI ESG Europe	25.2	3.5	17.0	11.4	11.7	5.1	11.1	3.0	8.0	4.1	100	0	229
MSCI US	16.5	20.4	14.8	9.7	13.9	2.5	9.6	6.9	2.9	3.0	0	100	637
MSCI ESG US	16.8	20.2	15.9	9.0	13.7	2.5	9.7	5.9	3.4	3.0	0	100	355
FTSE All World Dev.	21.8	10.7	12.4	13.5	11.5	3.4	12.3	6.6	4.5	1.7	21.4	56.1	2090
FTSE4Good Global	26.9	14.8	13.8	11.8	10.0	5.5	7.6	3.3	4.5	3.2	32.0	44.9	803
FTSE Dev. Europe	23.2	3.1	12.7	17.8	7.5	4.9	12.4	6.6	7.8	3.9	100	0	515
FTSE4Good Europe	26.5	3.6	14.8	14.4	7.6	6.0	8.9	6.4	8.0	4.0	100	0	326
FTSE US	18.4	16.6	14.1	10.5	14.0	2.5	11.4	7.3	2.3	3.0	0	100	649
FTSE4Good US	21.0	28.4	16.0	8.1	13.3	5.5	6.3	0.5	1.0	-	0	100	181
DJ Global	22.6	11.7	11.1	12.8	11.8	3.3	12.8	6.1	4.5	3.3	21.8	50.6	7303
DJSI World	24.4	12.5	17.6	11.8	5.5	2.8	11.2	5.0	6.8	2.4	52.0	30.1	319
DJ Europe	22.9	4.0	12.6	17.8	8.3	4.6	13.1	6.2	6.7	3.9	100	0	893
DJSI Europe	26.2	3.7	14.3	21.5	7.5	5.5	9.9	3.2	6.5	1.8	100	0	154
DJSI Europe 40	31.6	2.7	10.3	22.6	7.9	7.7	2.5	5.1	9.6	-	100	0	40
DJ US	19.1	16.5	13.5	10.2	14.3	2.2	12.1	6.5	2.5	3.2	0	100	1282
DJSI US	13.5	18.4	18.4	12.1	10.9	0.1	9.3	11.3	3.2	2.9	0	100	125
STOXX Global 1800	18.3	10.4	12.6	10.8	6.2	n.a.	11.3	6.0	n.a.	n.a.	22.0	56.0	1800
STOXX ESG Global	18.3	5.2	n.a.	6.3	7.2	5.9	11.5	6.1	5.5	4.9	51.2	14.5	
STOXX Europe 600	19.6	n.a.	13.1	15.2	n.a.	4.8	10.3	5.7	5.0	4.0	100	0	600
STOXX Europe Sust.	21.1	4.3	18.1	16.6	7.6	6.3	10.1	n.a.	n.a.	n.a.	100	0	
STOXX Europe 50	26.0	6.0	6.0	16.0	6.0	6.0	16.0	4.0	6.0	8.0	100	0	50
STOXX ESG Europe 50	26.1	10.7	8.4	20.7	3.9	10.7	7.7	n.a.	n.a.	n.a.	100	0	50
STOXX Europe Sust. 40	22.5	5.0	12.5	25.0	5.0	10.0	10.0	2.5	2.5	5.0	100	0	40
S&P Global 1200	20.6	14.5	12.9	10.6	12.4	3.8	10.7	6.6	4.5	3.3	23.4	56.8	1215
ECPI Global Ethical	19.0	20.0	16.0	8.0	13.0	5.0	8.0	8.0	2.0	1.0	13.3	63.0	300
ESI Ex. Global	24.4	9.3	8.1	16.3	11.6	8.1	11.6	1.2	5.8	1.2	n.a.	n.a.	86
S&P Europe 350	22.3	3.6	14.8	14.7	11.2	4.9	11.0	6.8	6.4	4.2	100	0	360
ESI Ex. Europe	21.9	5.1	4.1	13.3	17.9	4.6	14.3	3.6	10.2	5.1	100	0	196

Note: The sector classifications are on the Global Industry Classification Standard (GICS) or the Industry Classification Benchmark (ICB). For STOXX indices we have only the 10 highest weights for the Supersector classification. *N* denotes the number of firms. n.a.: not available. The weights are for September 2015.

Table 4: Summary statistics.

Indices	Mean (%)	St. dev. (%)	Skewness	Kurtosis	JB	Q(10)	LM(10)
MSCI World	0.0384	0.880	-0.478*	7.53*	999.7*	37.9*	222.8*
MSCI ESG World	0.0414	0.777	-0.486*	7.25*	888.5*	43.5*	253.7*
MSCI Europe	0.0179	1.268	-0.289*	5.97*	426.4*	11.4	168.1*
MSCI ESG Europe	0.0245	0.981	-0.273*	5.73*	362.4*	15.8	181.6*
MSCI US	0.0581	0.950	-0.552*	8.91*	1720.6*	54.1*	318.2*
MSCI ESG US	0.0549	0.935	-0.515*	8.96*	1545.6*	50.2*	316.2*
FTSE All World Dev.	0.0335	0.857	-0.504*	8.96*	1032.5*	49.5*	196.9*
FTSE4Good Global	0.0361	0.929	-0.400*	8.66*	744.3*	29.2*	221.1*
FTSE Dev. Europe	0.0411	0.966	-0.593*	3.34*	586.0*	44.4*	208.5*
FTSE4Good Europe	0.0254	0.992	-0.280*	8.58*	375.2*	14.2	170.0*
FTSE US	0.0607	1.209	-0.519*	6.22*	1860.2*	52.1*	310.9*
FTSE4Good US	0.0603	0.939	-0.491*	7.59*	1502.2*	53.5*	308.4*
DJ Global	0.0344	0.851	-0.546*	5.73*	1144.2*	51.6*	199.4*
DJSI World	0.0259	0.990	-0.311*	6.34*	696.1*	28.4*	181.2*
DJ Europe	0.0187	1.256	-0.303*	5.71*	470.9*	10.4	169.3*
DJSI Europe	0.0237	1.006	-0.245*	7.99*	353.8*	15.1	169.4*
DJSI Europe 40	0.0191	1.057	-0.192*	6.81*	359.3*	15.6	161.5*
DJ US	0.0586	0.990	-0.560*	5.75*	1729.3*	56.9*	330.2*
DJSI US	0.0490	0.891	-0.495*	6.06*	1211.4*	47.4*	292.3*
STOXX Global	0.0390	0.721	-0.591*	6.81*	734.7*	60.2*	172.7*
STOXX ESG Global	0.0325	0.870	-0.342*	7.25*	494.1*	50.1*	184.6*
STOXX Europe 600	0.0255	0.990	-0.306*	5.72*	396.3*	16.2**	175.5*
STOXX Europe Sustainability	0.0288	0.960	-0.283*	8.65*	377.0*	15.3	177.9*
STOXX Europe 50	-0.0485	0.954	-0.260*	5.63*	353.8*	15.05	173.6*
STOXX ESG Europe 50	0.0145	1.151	-0.306*	6.91*	686.1*	17.9**	160.3*
STOXX Europe Sustainability 40	0.0247	0.984	-0.208*	5.73*	354.9*	12.7	163.4*
S&P Global	0.0375	0.885	-0.468*	4.52*	997.3*	35.6*	258.8*
ECPI Global Ethical	0.0431	0.736	-0.464*	5.71*	555.2*	47.7*	222.8*
ESI Excellence Global	0.0357	0.713	-0.369*	6.32*	379.0*	38.8*	173.1*
S&P Europe	0.0186	1.229	-0.156*	5.51*	297.3*	16.5**	159.4*
ESI Excellence Europe	0.0292	1.032	-0.263*	5.75*	358.7*	15.7	177.0*

Note: * means significant at 5% level.

Table 5: Risk measures for Non-ESG and ESG indices.

	Non-ESG indices					ESG indices				
	SD (%)	SV (%)	VaR	CVaR	MVaR	SD (%)	SV (%)	VaR	CVaR	MVaR
MSCI World	0.880	0.937	1.426	1.782	1.391	0.777	0.843	1.262	1.559	1.227
MSCI Europe	1.268	1.306	1.977	2.789	2.018	0.981	1.023	1.533	2.039	1.550
MSCI US	0.950	1.043	1.467	1.898	1.478	0.935	1.012	1.516	1.847	1.469
FTSE4Good Global	0.857	0.924	1.357	1.755	1.340	0.929	0.980	1.471	1.914	1.433
FTSE4Good US	1.209	1.313	1.886	2.413	1.876	0.939	1.020	1.434	1.862	1.468
FTSE4Good Europe	0.966	1.051	1.491	2.169	1.582	0.992	1.040	1.600	2.093	1.512
DJSI Global	0.851	0.919	1.350	1.741	1.394	0.990	1.035	1.530	2.024	1.563
DJSI Europe	1.256	1.302	1.908	2.787	2.010	1.006	1.042	1.609	2.101	1.539
DJSI Europe 40	1.256	1.302	1.908	2.787	2.010	1.057	1.092	1.732	2.190	1.631
DJSI US	0.990	1.087	1.526	1.966	1.608	0.891	0.968	1.403	1.753	1.430
STOXX Global	0.721	0.775	1.108	1.539	1.165	0.870	0.920	1.378	1.760	1.354
STOXX Europe 50	0.954	0.995	1.521	2.003	1.524	1.151	1.218	1.834	2.414	1.817
STOXX Europe Sust.	0.990	1.035	1.576	2.016	1.573	0.960	0.999	1.478	2.016	1.459
STOXX Europe Sust. 40	0.954	0.995	1.521	2.003	1.524	0.984	1.025	1.514	2.099	1.539
ECPI Global	0.885	0.954	1.456	1.720	1.399	0.736	0.786	1.124	1.601	1.177
ESI Global	0.885	0.954	1.456	1.720	1.399	0.713	0.756	1.149	1.541	1.119
ESI Europe	1.229	1.255	1.926	2.642	1.921	1.032	1.082	1.640	2.129	1.625

Note: SD and SV denote the standard deviation and the semivariance, respectively; VaR is the average of the Value-at-Risk; CVaR is the Conditional VaR; and MVaR is the average of the Modified VaR.

Table 6: Risk measures between ESG indices in World and US markets.

	SD (%)	SV (%)	VaR	CVaR	MVaR	SD (%)	SV (%)	VaR	CVaR	MVaR
World/Global										
MSCI vs FTSE4Good	0.777	0.843	1.262	1.559	1.227	0.929	0.980	1.471	1.914	1.433
MSCI vs DJSI	0.777	0.843	1.262	1.559	1.227	0.990	1.035	1.530	2.024	1.563
MSCI vs STOXX	0.777	0.843	1.262	1.559	1.227	0.870	0.920	1.378	1.760	1.354
MSCI vs ECPI	0.777	0.843	1.262	1.559	1.227	0.736	0.786	1.124	1.601	1.177
MSCI vs ESI	0.777	0.843	1.262	1.559	1.227	0.713	0.756	1.149	1.541	1.119
FTSE4Good vs DJSI	0.929	0.980	1.471	1.914	1.433	0.990	1.035	1.530	2.024	1.563
FTSE4Good vs STOXX	0.929	0.980	1.471	1.914	1.433	0.870	0.920	1.378	1.760	1.354
FTSE4Good vs ECPI	0.929	0.980	1.471	1.914	1.433	0.736	0.786	1.124	1.601	1.177
FTSE4Good vs ESI	0.929	0.980	1.471	1.914	1.433	0.713	0.756	1.149	1.541	1.119
DJSI vs STOXX	0.990	1.035	1.530	2.024	1.563	0.870	0.920	1.378	1.760	1.354
DJSI vs ECPI	0.990	1.035	1.530	2.024	1.563	0.736	0.786	1.124	1.601	1.177
DJSI vs ESI	0.990	1.035	1.530	2.024	1.563	0.713	0.756	1.149	1.541	1.119
STOXX vs ECPI	0.870	0.920	1.378	1.760	1.354	0.736	0.786	1.124	1.601	1.177
STOXX vs ESI	0.870	0.920	1.378	1.760	1.354	0.713	0.756	1.149	1.541	1.119
ECPI vs ESI	0.736	0.786	1.124	1.601	1.177	0.713	0.756	1.149	1.541	1.119
US										
MSCI vs FTSE4Good	0.935	1.012	1.516	1.847	1.469	0.939	1.020	1.434	1.862	1.468
MSCI vs DJSI	0.935	1.012	1.516	1.847	1.469	0.891	0.968	1.403	1.753	1.430
FTSE4Good vs DJSI	0.939	1.020	1.434	1.862	1.468	0.891	0.968	1.403	1.753	1.430

Note: SD and SV denote the standard deviation and the semivariance, respectively; VaR is the average of the Value-at-Risk; ESF is the Conditional VaR; and MVaR is the average of the Modified VaR.

Table 7: Risk measures between ESG indices in European markets.

	SD (%)	SV (%)	VaR	CVaR	MVaR	SD (%)	SV (%)	VaR	CVaR	MVaR
Europe										
MSCI vs FTSE4Good	0.981	1.023	1.533	2.039	1.550	0.992	1.040	1.600	2.093	1.512
MSCI vs DJSI	0.981	1.023	1.533	2.039	1.550	1.006	1.042	1.609	2.101	1.539
MSCI vs DJSI 40	0.981	1.023	1.533	2.039	1.550	1.057	1.092	1.732	2.190	1.631
MSCI vs STOXX	0.981	1.023	1.533	2.039	1.550	1.151	1.218	1.834	2.414	1.817
MSCI vs STOXX Sust.	0.981	1.023	1.533	2.039	1.550	0.960	0.999	1.478	2.016	1.459
MSCI vs STOXX Sust. 40	0.981	1.023	1.533	2.039	1.550	0.984	1.025	1.514	2.099	1.539
MSCI vs ESI	0.981	1.023	1.533	2.039	1.550	1.032	1.082	1.640	2.129	1.625
FTSE4Good vs DJSI	0.992	1.040	1.600	2.093	1.512	1.006	1.042	1.609	2.101	1.539
FTSE4Good vs DJSI 40	0.992	1.040	1.600	2.093	1.512	1.057	1.092	1.732	2.190	1.631
FTSE4Good vs STOXX	0.992	1.040	1.600	2.093	1.512	1.151	1.218	1.834	2.414	1.817
FTSE4Good vs STOXX Sust.	0.992	1.040	1.600	2.093	1.512	0.960	0.999	1.478	2.016	1.459
FTSE4Good vs STOXX Sust. 40	0.992	1.040	1.600	2.093	1.512	0.984	1.025	1.514	2.099	1.539
FTSE4Good vs ESI	0.992	1.040	1.600	2.093	1.512	1.032	1.082	1.640	2.129	1.625
DJSI vs DJSI 40	1.006	1.042	1.609	2.101	1.539	1.057	1.092	1.732	2.190	1.631
DJSI vs STOXX	1.006	1.042	1.609	2.101	1.539	1.151	1.218	1.834	2.414	1.817
DJSI vs STOXX Sust.	1.006	1.042	1.609	2.101	1.539	0.960	0.999	1.478	2.016	1.459
DJSI vs STOXX Sust. 40	1.006	1.042	1.609	2.101	1.539	0.984	1.025	1.514	2.099	1.539
DJSI vs ESI	1.006	1.042	1.609	2.101	1.539	1.032	1.082	1.640	2.129	1.625
DJSI 40 vs STOXX	1.057	1.092	1.732	2.190	1.631	1.151	1.218	1.834	2.414	1.817
DJSI 40 vs STOXX Sust.	1.057	1.092	1.732	2.190	1.631	0.960	0.999	1.478	2.016	1.459
DJSI 40 vs STOXX Sust. 40	1.057	1.092	1.732	2.190	1.631	0.984	1.025	1.514	2.099	1.539
DJSI 40 vs ESI	1.057	1.092	1.732	2.190	1.631	1.032	1.082	1.640	2.129	1.625
STOXX vs STOXX Sust.	1.151	1.218	1.834	2.414	1.817	0.960	0.999	1.478	2.016	1.459
STOXX vs STOXX Sust. 40	1.151	1.218	1.834	2.414	1.817	0.984	1.025	1.514	2.099	1.539
STOXX vs ESI	1.151	1.218	1.834	2.414	1.817	1.032	1.082	1.640	2.129	1.625
STOXX Sust. vs ESI	0.960	0.999	1.478	2.016	1.459	1.032	1.082	1.640	2.129	1.625
STOXX Sust. vs STOXX Sust. 40	0.960	0.999	1.478	2.016	1.459	0.984	1.025	1.514	2.099	1.539
STOXX Sust. 40 vs ESI	0.984	1.025	1.514	2.099	1.539	1.032	1.082	1.640	2.129	1.625

Note: SD and SV denote the standard deviation and the semivariance, respectively; VaR is the average of the Value-at-Risk; ESF is the Conditional VaR; and MVaR is the average of the Modified VaR.

Table 8: Performance measures for Non-ESG and ESG indices.

	Non-ESG indices							ESG indices						
	Mean	SR	ASR	SOR	RVaR	CSR	MSR	Mean	SR	ASR	SOR	RVaR	CSR	MSR
MSCI World	0.0384	-2.90	-2.91	-2.72	-1.79	-1.43	-1.84	0.0414	-2.90	-2.91	-2.68	-1.79	-1.45	-1.84
MSCI Europe	0.0179	-3.64	-3.64	-3.53	-2.33	-1.65	-2.28	0.0245	-4.03	-4.04	-3.86	-2.58	-1.94	-2.55
MSCI US	0.0581	-0.62	-0.62	-0.57	-0.40	-0.31	-0.40	0.0549	-0.97	-0.97	-0.89	-0.60	-0.49	-0.62
FTSE4Good Global	0.0335	-3.56	-3.57	-3.30	-2.25	-1.74	-2.28	0.0361	-3.01	-3.01	-2.85	-1.90	-1.46	-1.95
FTSE4Good US	0.0607	-0.27	-0.27	-0.25	-0.17	-0.13	-0.17	0.0603	-0.39	-0.39	-0.36	-0.25	-0.20	-0.25
FTSE4Good Europe	0.0411	-2.36	-2.37	-2.17	-1.53	-1.05	-1.44	0.0254	-3.89	-3.90	-3.71	-2.41	-1.84	-2.55
DJSI World	0.0344	-3.47	-3.48	-3.22	-2.19	-1.70	-2.12	0.0259	-3.85	-3.85	-3.68	-2.49	-1.88	-2.44
DJSI Europe	0.0187	-3.60	-3.61	-3.48	-2.37	-1.62	-2.25	0.0237	-4.00	-4.01	-3.86	-2.50	-1.92	-2.62
DJSI Europe 40	0.0187	-3.60	-3.61	-3.48	-2.37	-1.62	-2.25	0.0191	-4.25	-4.25	-4.11	-2.59	-2.05	-2.75
DJSI US	0.0586	-0.54	-0.54	-0.49	-0.35	-0.27	-0.33	0.0490	-1.68	-1.68	-1.54	-1.07	-0.85	-1.05
STOXX Global	0.0390	-3.47	-3.48	-3.22	-2.25	-1.62	-2.15	0.0325	-3.61	-3.62	-3.42	-2.28	-1.79	-2.32
STOXX Europe 50	0.0155	-5.08	-5.10	-4.87	-3.19	-2.42	-3.18	0.0145	-4.30	-4.30	-4.06	-2.70	-2.05	-2.72
STOXX Europe Sust.	0.0255	-3.93	-3.94	-3.76	-2.47	-1.93	-2.47	0.0288	-3.66	-3.67	-3.52	-2.38	-1.74	-2.41
STOXX Europe Sust. 40	0.0155	-5.08	-5.10	-4.87	-3.19	-2.42	-3.18	0.0247	-3.99	-3.99	-3.83	-2.59	-1.87	-2.55
ECPI Global	0.0375	-3.00	-3.00	-2.78	-1.82	-1.54	-1.90	0.0431	-2.84	-2.84	-2.66	-1.86	-1.31	-1.78
ESI Global	0.0375	-3.00	-3.00	-2.78	-1.82	-1.54	-1.90	0.0357	-3.97	-3.97	-3.74	-2.46	-1.83	-2.53
ESI Europe	0.0186	-3.69	-3.69	-3.62	-2.36	-1.72	-2.36	0.0292	-3.37	-3.37	-3.22	-2.12	-1.64	-2.14

Note: All the measures of performance are given in percentage. SR, ASR and SOR denote the Sharpe ratio, Adjusted Sharpe ratio and Sortino ratio, respectively, based on standard risk measures, and RVaR, CSR and MSR denote the Reward-to-VaR ratio, Conditional Sharpe ratio and Modified Sharpe ratio, respectively, based on tail risk measures.

Table 9: Performance measures between ESG indices for World and US markets.

	Mean	SR	ASR	SOR	RVaR	CSR	MSR	Mean	SR	ASR	SOR	RVaR	CSR	MSR
World														
MSCI vs FTSE4Good	0.0414	-2.90	-2.91	-2.68	-1.79	-1.45	-1.84	0.0361	-3.01	-3.01	-2.85	-1.90	-1.46	-1.95
MSCI vs DJSI	0.0414	-2.90	-2.91	-2.68	-1.79	-1.45	-1.84	0.0259	-3.85	-3.85	-3.68	-2.49	-1.88	-2.44
MSCI vs STOXX	0.0414	-2.90	-2.91	-2.68	-1.79	-1.45	-1.84	0.0325	-3.61	-3.62	-3.42	-2.28	-1.79	-2.32
MSCI vs ECPI	0.0414	-2.90	-2.91	-2.68	-1.79	-1.45	-1.84	0.0431	-2.84	-2.84	-2.66	-1.86	-1.31	-1.78
MSCI vs ESI	0.0414	-2.90	-2.91	-2.68	-1.79	-1.45	-1.84	0.0357	-3.97	-3.97	-3.74	-2.46	-1.83	-2.53
FTSE4Good vs DJSI	0.0361	-3.01	-3.01	-2.85	-1.90	-1.46	-1.95	0.0259	-3.85	-3.85	-3.68	-2.49	-1.88	-2.44
FTSE4Good vs STOXX	0.0361	-3.01	-3.01	-2.85	-1.90	-1.46	-1.95	0.0325	-3.61	-3.62	-3.42	-2.28	-1.79	-2.32
FTSE4Good vs ECPI	0.0361	-3.01	-3.01	-2.85	-1.90	-1.46	-1.95	0.0431	-2.84	-2.84	-2.66	-1.86	-1.31	-1.78
FTSE4Good vs ESI	0.0361	-3.01	-3.01	-2.85	-1.90	-1.46	-1.95	0.0357	-3.97	-3.97	-3.74	-2.46	-1.83	-2.53
DJSI vs STOXX	0.0259	-3.85	-3.85	-3.68	-2.49	-1.88	-2.44	0.0325	-3.61	-3.62	-3.42	-2.28	-1.79	-2.32
DJSI vs ECPI	0.0259	-3.85	-3.85	-3.68	-2.49	-1.88	-2.44	0.0431	-2.84	-2.84	-2.66	-1.86	-1.31	-1.78
DJSI vs ESI	0.0259	-3.85	-3.85	-3.68	-2.49	-1.88	-2.44	0.0357	-3.97	-3.97	-3.74	-2.46	-1.83	-2.53
STOXX vs ECPI	0.0325	-3.61	-3.62	-3.42	-2.28	-1.79	-2.32	0.0431	-2.84	-2.84	-2.66	-1.86	-1.31	-1.78
STOXX vs ESI	0.0325	-3.61	-3.62	-3.42	-2.28	-1.79	-2.32	0.0357	-3.97	-3.97	-3.74	-2.46	-1.83	-2.53
ECPI vs ESI	0.0431	-2.84	-2.84	-2.66	-1.86	-1.31	-1.78	0.0357	-3.97	-3.97	-3.74	-2.46	-1.83	-2.53
US														
MSCI vs FTSE4Good	0.0549	-0.97	-0.97	-0.89	-0.60	-0.49	-0.62	0.0603	-0.39	-0.39	-0.36	-0.25	-0.20	-0.25
MSCI vs DJSI	0.0549	-0.97	-0.97	-0.89	-0.60	-0.49	-0.62	0.0490	-1.68	-1.68	-1.54	-1.07	-0.85	-1.05
FTSE4Good vs DJSI	0.0603	-0.39	-0.39	-0.36	-0.25	-0.20	-0.25	0.0490	-1.68	-1.68	-1.54	-1.07	-0.85	-1.05

Note: All the measures of performance are given in percentage. SR, ASR and SOR denote the Sharpe ratio, Adjusted Sharpe ratio and Sortino ratio, respectively, based on standard risk measures, and RVaR, CSR and MSR denote the Reward-to-VaR ratio, Conditional Sharpe ratio and Modified Sharpe ratio, respectively, based on tail risk measures.

Table 10: Performance measures between ESG indices for European markets.

	Mean	SR	ASR	SOR	RVaR	CSR	MSR	Mean	SR	ASR	SOR	RVaR	CSR	MSR
Europe														
MSCI vs FTSE4Good	0.0245	-4.03	-4.04	-3.86	-2.58	-1.94	-2.55	0.0254	-3.89	-3.90	-3.71	-2.41	-1.84	-2.55
MSCI vs DJSI	0.0245	-4.03	-4.04	-3.86	-2.58	-1.94	-2.55	0.0237	-4.00	-4.01	-3.86	-2.50	-1.92	-2.62
MSCI vs DJSI 40	0.0245	-4.03	-4.04	-3.86	-2.58	-1.94	-2.55	0.0191	-4.25	-4.25	-4.11	-2.59	-2.05	-2.75
MSCI vs STOXX 50	0.0245	-4.03	-4.04	-3.86	-2.58	-1.94	-2.55	0.0145	-4.30	-4.30	-4.06	-2.70	-2.05	-2.72
MSCI vs STOXX Sust.	0.0245	-4.03	-4.04	-3.86	-2.58	-1.94	-2.55	0.0288	-3.66	-3.67	-3.52	-2.38	-1.74	-2.41
MSCI vs STOXX Sust. 40	0.0245	-4.03	-4.04	-3.86	-2.58	-1.94	-2.55	0.0247	-3.99	-3.99	-3.83	-2.59	-1.87	-2.55
MSCI vs ESI	0.0245	-4.03	-4.04	-3.86	-2.58	-1.94	-2.55	0.0292	-3.37	-3.37	-3.22	-2.12	-1.64	-2.14
FTSE4Good vs DJSI	0.0254	-3.89	-3.90	-3.71	-2.41	-1.84	-2.55	0.0237	-4.00	-4.01	-3.86	-2.50	-1.92	-2.62
FTSE4Good vs DJSI 40	0.0254	-3.89	-3.90	-3.71	-2.41	-1.84	-2.55	0.0191	-4.25	-4.25	-4.11	-2.59	-2.05	-2.75
FTSE4Good vs STOXX 50	0.0254	-3.89	-3.90	-3.71	-2.41	-1.84	-2.55	0.0145	-4.30	-4.30	-4.06	-2.70	-2.05	-2.72
FTSE4Good vs STOXX Sust.	0.0254	-3.89	-3.90	-3.71	-2.41	-1.84	-2.55	0.0288	-3.66	-3.67	-3.52	-2.38	-1.74	-2.41
FTSE4Good vs STOXX Sust. 40	0.0254	-3.89	-3.90	-3.71	-2.41	-1.84	-2.55	0.0247	-3.99	-3.99	-3.83	-2.59	-1.87	-2.55
FTSE4Good vs ESI	0.0254	-3.89	-3.90	-3.71	-2.41	-1.84	-2.55	0.0292	-3.37	-3.37	-3.22	-2.12	-1.64	-2.14
DJSI vs DJSI 40	0.0237	-4.00	-4.01	-3.86	-2.50	-1.92	-2.62	0.0191	-4.25	-4.25	-4.11	-2.59	-2.05	-2.75
DJSI vs STOXX 50	0.0237	-4.00	-4.01	-3.86	-2.50	-1.92	-2.62	0.0145	-4.30	-4.30	-4.06	-2.70	-2.05	-2.72
DJSI vs STOXX Sust.	0.0237	-4.00	-4.01	-3.86	-2.50	-1.92	-2.62	0.0288	-3.66	-3.67	-3.52	-2.38	-1.74	-2.41
DJSI vs STOXX Sust. 40	0.0237	-4.00	-4.01	-3.86	-2.50	-1.92	-2.62	0.0247	-3.99	-3.99	-3.83	-2.59	-1.87	-2.55
DJSI vs ESI	0.0237	-4.00	-4.01	-3.86	-2.50	-1.92	-2.62	0.0292	-3.37	-3.37	-3.22	-2.12	-1.64	-2.14
DJSI 40 vs STOXX 50	0.0191	-4.25	-4.25	-4.11	-2.59	-2.05	-2.75	0.0145	-4.30	-4.30	-4.06	-2.70	-2.05	-2.72
DJSI 40 vs STOXX Sust.	0.0191	-4.25	-4.25	-4.11	-2.59	-2.05	-2.75	0.0288	-3.66	-3.67	-3.52	-2.38	-1.74	-2.41
DJSI 40 vs STOXX Sust. 40	0.0191	-4.25	-4.25	-4.11	-2.59	-2.05	-2.75	0.0247	-3.99	-3.99	-3.83	-2.59	-1.87	-2.55
DJSI 40 vs ESI	0.0191	-4.25	-4.25	-4.11	-2.59	-2.05	-2.75	0.0292	-3.37	-3.37	-3.22	-2.12	-1.64	-2.14
STOXX 50 vs STOXX Sust.	0.0145	-4.30	-4.30	-4.06	-2.70	-2.05	-2.72	0.0288	-3.66	-3.67	-3.52	-2.38	-1.74	-2.41
STOXX 50 vs STOXX Sust. 40	0.0145	-4.30	-4.30	-4.06	-2.70	-2.05	-2.72	0.0247	-3.99	-3.99	-3.83	-2.59	-1.87	-2.55
STOXX 50 vs ESI	0.0145	-4.30	-4.30	-4.06	-2.70	-2.05	-2.72	0.0292	-3.37	-3.37	-3.22	-2.12	-1.64	-2.14
STOXX Sust. vs STOXX Sust. 40	0.0288	-3.66	-3.67	-3.52	-2.38	-1.74	-2.41	0.0247	-3.99	-3.99	-3.83	-2.59	-1.87	-2.55
STOXX Sust. vs ESI	0.0288	-3.66	-3.67	-3.52	-2.38	-1.74	-2.41	0.0292	-3.37	-3.37	-3.22	-2.12	-1.64	-2.14
STOXX Sust. 40 vs ESI	0.0247	-3.99	-3.99	-3.83	-2.59	-1.87	-2.55	0.0292	-3.37	-3.37	-3.22	-2.12	-1.64	-2.14

Note: All the measures of performance are given in percentage. SR, ASR and SOR denote the Sharpe ratio, Adjusted Sharpe ratio and Sortino ratio, respectively, based on standard risk measures, and RVaR, CSR and MSR denote the Reward-to-VaR ratio, Conditional Sharpe ratio and Modified Sharpe ratio, respectively, based on tail risk measures.

References

[1] Agarwal, V., Naik, N.Y. (2004). Risk and portfolio decisions involving hedge funds. Review of Financial Studies, 17(1), 63-98.

[2] Artzner, P., Delbaen, F., Eber, J-M., Heath, D. (1999). Coherent measures of risk. Mathematical Finance, 9, 203-228.

[3] Bacon, C.R. (2008). Practical Portfolio Performance Measurement and Attribution. Chichester: Wiley.

[4] Barnett, M.L., Salomon, R.M. (2006). Beyond dichotomy: The curvilinear relationship between social responsibility and financial performance. Strategic Management Journal, 27(11), 1101-1122.

[5] Bauer, R., Koedijk, K., Otten R., (2005). International evidence on ethical mutual fund performance and investment style. Journal of Banking and Finance, 29, 1751-1767.

[6] Bauer, R., Derwall, J., Otten, R., (2007). The ethical mutual funds performance debate: New evidence for Canada. Journal of Business Ethics, 70(2), 111-124.

[7] Belghitar, Y., Clark, E., Deshmukh, N. (2014). Does it pay to be ethical? Evidence from the FTSE4Good. Journal of Banking and Finance, 47, 54-62.

[8] Benabou, R., Tirole, J. (2010). Individual and Corporate Social Responsibility. Economica, 77, 1-19.

[9] Bodson, L., Grandin, P., Hubner, G., Lambert, M., (2010). Portfolio performance (in French), Pearson.

[10] Capelle-Blancard, G., Monjon, S. (2014). The Performance of socially Responsible Funds: Does the Screening Process Matter? European Journal Management, 20, 494-520.

[11] Caporin, M., Jannin, G.M., Lisi, F., Maillet, B.B. (2014). A survey on the four familes of performance measures. Journal of Economic Surveys, 28(5), 917-942.

[12] Chan, P.T., Walter, T. (2014). Investment performance of "environmentally friendly" firms and their initial public offers and seasoned equity offers. Journal of Banking and Finance, 44, 177-188.

[13] Cogneau, P., Hübner, G. (2009a). The (more than) 100 ways to measure portfolio performance. Part 1: standardized risk-adjusted measures. Journal of Performance Measurement, 13, 56-71.

[14] Cogneau, P., Hübner, G. (2009b). The (more than) 100 ways to measure portfolio performance. Part 2: special measures and comparison. Journal of Performance Measurement 14, 56-69.

[15] Collison, D.J., Cobb, G., Power, D.M., Stevenson, L.A. (2008). The financial performance of the FTSE4Good indices. Corporate Social Responsibility and Environmental Management, 15, 14-28.

[16] Consolandi, C., Jaiswal-Dale, A., Poggiani, E., Vercelli, A. (2009). Global standards and ethical stock indexes: The case of the Dow Jones Sustainability Stoxx Index. Journal of Business Ethics, 87, 185-197.

[17] Dittmar, R. (2002). Nonlinear asset kernels kurtosis preference and evidence from cross section of equity returns. Journal of Finance, 57, 369-403.

[18] Dowd, K. (2000). Adjusting for risk: An improved sharpe ratio. International Review of Economics and Finance, 9, 209-222.

[19] El Ghoul, S., Guedhami, O., Kwok, C.C.Y., Mishra, D.R., (2011). Does corporate social responsibility affect the cost of capital? Journal of Banking and Finance, 35(9), 2388-2406.

[20] Fang, H., Lai, T. (1997). Co-kurtosis and capital asset pricing. Financial Review, 32, 293-307.

[21] Favre, L., Galeano, J.A., (2002). Mean-modified Value at Risk optimization with hedge funds. Journal Alternative Investments, 5, 21-25.

[22] Galema, R., Plantinga, A., Scholtens, B. (2008). The stocks at stake: Return and risk in socially responsible investment. Journal of Banking and Finance, 32(12), 2646-2654.

[23] Geczy, C., Stambaugh, R., Levin, D., 2006. Investing in socially responsible mutual funds. Working Paper, Wharton School.

[24] Global Sustainable Investment Alliance (2014). Global Sustainable Investment Review, Report. Retreived from http://www.gsi-alliance.org/

[25] Hamilton, S., Joe, H., Statman, M. (1993). Doing well while doing good? The investment performance of socially responsible mutual funds. Financial Analysts Journal, 49(6), 62-66.

[26] Hubner, G., (2007). How does performance measures perform? Journal of Portfolio Management, 33(4), 64-74.

[27] Kaplan, P., Knowles, J. (2004). Kappa: A Generalized Downside Risk-Adjusted Performance Measure. Journal of Performance Measurement, 8(3), 42-54.

[28] Kempf, A., Osthoff, P. (2007). The effect of socially responsible investing on financial performance. European Financial Management, 13, 908-922.

[29] Kraus, A., Litzenberger, R. (1976). Skewness preference and the valuation of risky assets. Journal of Finance, 31, 1085-1099.

[30] Le Sourd, V. (2007). Performance measurement for traditional investment. Working Paper, EDHEC Business School.

[31] Le Sourd, V. (2012). The Performance of Socially Responsible Investment ? A Study of the French Market. EDHEC Risk and Asset Management Research Centre.

[32] Markowitz, H. (1952). Portfolio Selection. Journal of Finance, 7(1), 77-99.

[33] Marlowe, J. (2014). Socially Responsible Investing and Public Pension Fund Performance. Public Performance and Management Review, 38, 337-358.

[34] Novethic (2013). An overview of ESG rating agency. Research report.

[35] Pezier, J., White, A. (2008). The Relative Merits of Alternative Investments in Passive Portfolios. Journal Alternative Investments, 10(4), 37-49.

[36] Post, T., Vlient, P., Levy, H. (2008). Risk aversion and skewness preference: A comment. Journal of Banking and Finance, 32, 1178-1187.

[37] Pouget, S. (2014). On the Financial Performance of Socially Responsible Investments. Bankers, Markets and Investors, 128.

[38] Renneboog, L., Horst J.T., Zhang C., (2008a). Socially responsible investments: Institutional aspects, performance, and investor behavior. Journal of Banking and Finance, 32, 1723-1742.

[39] Renneboog, L., Horst J.T., Zhang C., (2008b). The price of ethics and stakeholder governance: The performance of socially responsible mutual funds. Journal of Corporate Finance, 14, 302-322.

[40] Rockafellar, R.T., Uryasev, S. (2002). Conditional Value-at-Risk for general loss distributions. Journal of Banking and Finance, 26, 1443-1471.

[41] Sauer, D. (1997). The impact of social-responsibility screens on investment performance: Evidence from the Domini 400 social index and Domini equity fund. Review of Financial Economics, 6, 23-35.

[42] Scaillet, O. (2000). Nonparametric estimation and sensitivity analysis of expected shortfall. Mathematical Finance, 14, 115-129.

[43] Sharpe, W.F. (1966). Mutual fund performance. Journal of Business, 39, 119-138.

[44] Schröder, M. (2007). Is there a difference? The performance characteristics of SRI equity indices. Journal of Business Finance and Accounting, 34, 331-348.

[45] Social Investment Forum (SIF) (2014). Report on Socially Responsible Investing Trends in the United States. Retrieved from: http://www.socialinvest.org

[46] Sjöström, E. (2011). The Performance of Socially Responsible Investment - A Review of Scholarly Studies Published 2008-2010, Available at SSRN: http://ssrn.com/abstract=1948169.

[47] Sortino, F., Price, L. (1994). Performance measurement in a downside risk framework. Journal of Investing, 3(3), 59-64.

[48] Statman, M., (2000). Socially responsible mutual funds. Financial Analysts Journal, 56(3), 30-39.

[49] Statman, M., (2006). Socially responsible indexes: Composition, performance, and tracking error. Journal of Portfolio Management, 32, 100-109.

[50] UNEP Financial Initiative and Mercer (2007). Demystifying responsible investment performance: A review of key academic and broker research on ESG factors. Report.

[51] Vigeo (2015). Continued rapid growth for Green, Social and Ethical retail funds in Europe. 2015 Review. Retrieved from: http://www.vigeo.com

[52] Weisman, A. (2002). Informationless investing and hedge fund performance measurement bias. Journal of Portfolio Management, 26, 81-91.

Appendix A

The Global Sustainable Investment Association (GSIA) suggests a classification of ESG strategies with seven distinct approaches:

- Negative/exclusionary screening: the exclusion from a fund or portfolio of certain sectors, companies or practices based on specific ESG criteria;
- Positive/best-in-class screening: investment in sectors, companies or projects selected for positive ESG performance relative to industry peers;
- Norms-based screening: screening of investments against minimum standards of business practice based on international norms;
- Integration of ESG factors: the systematic and explicit inclusion by investment managers of environmental, social and governance factors into traditional financial analysis;
- Sustainability themed investing: investment in themes or assets specifically related to sustainability (for example clean energy, green technology or sustainable agriculture);
- Impact/community investing: targeted investments, typically made in private markets, aimed at solving social or environmental problems, and including community investing, where capital is specifically directed to traditionally underserved individuals or communities, as well as financing that is provided to businesses with a clear social or environmental purpose; and
- Corporate engagement and shareholder action: the use of shareholder power to influence corporate behavior, including through direct corporate engagement (i.e., communicating with senior management and/or boards of companies), filing or co-filing shareholder proposals, and proxy voting that is guided by comprehensive ESG guidelines.

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